ANALYSIS OF CONTACTS BETWEEN ROUGH SURFACES USING FINITE ELEMENT METHODS

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We developed a robust algorithm to generate finite element meshes for self-affine fractal surfaces. These were used to determine the distribution and spatial correlations of contact areas and local stresses as a function of external force, mesh resolution, Poisson's ratio, plasticity, and roughness exponent and amplitude. For elastic surfaces, the contact area initially rises linearly with external force. The slope depends weakly and non-monotonically on Poisson's ratio. The contact area and local stress show power law spatial correlations. The distribution of contact areas appears to follow a power law, while the distribution of local stresses has an exponential tail.